TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No. 250901/00

In Re Application Of: Kiyokazu MATSUMOTO

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
09/929,488	August 15, 2001	Rude, Timothy L.	21254	2883	1362

Invention: **ACTIVE MATRIX TYPE LIQUID CRYSTAL DISPLAY DEVICE**

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **December 6, 2004.**

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Frederick Cooperrider

Signature

Dated: **February 7, 2005**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

Matsumoto, Kimikazu

Serial No.: 09/929,488 Group Art Unit: 2883

Filed: August 15, 2001 Examiner: Rude, T.

For: **ACTIVE MATRIX TYPE LIQUID CRYSTAL DISPLAY DEVICE**

Commissioner of Patents
Alexanderia, VA 22313-1450

APPELLANT'S BRIEF ON APPEAL

Sir:

Appellant respectfully appeals the rejection of claims 1-20 in the Office Action dated August 5, 2004. A Notice of Appeal was timely filed on December 6, 2004.

I. REAL PARTY IN INTEREST

The real party in interest is NEC LCD Technologies, Ltd, assignee of 100% interest of the above-referenced patent application.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant, Appellant's legal representative, or Assignee, which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-20 are all of the claims presently pending in the application. The Examiner has maintained a constructive withdrawal of claims 18-20. Appellant believes that the claim amendments entered into the record by the Amendment under 37 C.F.R. §1.111, filed on May 25, 2004, revised the claim language to eliminate, as best understood, the Examiner's rationale for the constructive withdrawal. Therefore, as best understood from the Examiner's statement in Paragraph 3 on page 2 of the Office Action dated August 5, 2004, making final the rejection of record, these claims 18-20 are subject to rejoinder upon resolution of allowability of the product claims.

In this Final Office Action dated August 5, 2004, the Examiner maintained and made final the previous rejection of claims 1-17. More specifically, claims 1-7 and 10-17 now stand rejected under 35 USC §103(a) as unpatentable over US Patent 5,576,867 to Bauer et al. Claims 8 and 9 stand rejected under 35 USC §103(a) as unpatentable over Bauer, further in view of Appellant's Admitted Prior Art. Claims 8 and 9 also stand rejected under 35 USC §103(a) as unpatentable over Bauer, further in view of US Patent 6,532,053 to Ohta et al.

Therefore, claims 1-17 are the object of this Appeal, with claims 18-20 as subject to rejoinder upon a determination of allowability of claims 1-17.

IV. STATUS OF AMENDMENTS

An Amendment Under 37 CFR §1.116 was filed on November 4, 2004. In the Advisory Action dated November 29, 2004, the Examiner indicated that the arguments in the Amendment Under 37 CFR §1.116 were not persuasive, that the rejection currently of record was maintained, and that the Amendment would not be entered into the record, since the Examiner considered that no issues for Appeal were simplified.

Appellant respectfully disagrees with the Examiner's statements in this Advisory Action, as further reflected in the arguments hereinbelow. However, it is noted that, since the claim changes in this After Final Amendment were intended to clarify the concepts for the Examiner's benefit and such changes in wording are not necessary for distinguishing from

the prior art of record, Appellant has not filed a Petition to force entry of this After Final Amendment.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's invention, as disclosed and shown in Figure 1B and claimed in independent claim 1, is directed to an active matrix type liquid crystal display device including a thin film transistor (TFT) substrate 300 having a common wiring and a source/drain wiring formed on a first substrate 51. The first substrate is provided with an insulating film 60 covering the common wiring and the source/drain wiring, and the insulating film is coated with a first alignment layer 61.

An opposite substrate 400, opposing to the TFT substrate 300, has a second alignment layer 61 formed on a second substrate 71. A liquid crystal 70 is held between the first alignment layer 61 and the second alignment layer 61. A common electrode 53 and a pixel electrode 58 is wired in parallel with each other and formed as parts of the common wiring and the source/drain wiring, respectively, so that an angle made between a direction in which the first alignment layer is subjected to an aligning treatment and a direction in which the second alignment layer is subjected to an aligning treatment is set to a value of 0.5 to 4.0 degrees. As explained at page 16, lines 16-23, this value provides a setting that concurrently decreases a threshold voltage between the pixel electrode and the common electrode required to change a direction of the liquid crystal therebetween, increases a response of switching of the liquid crystal (Figure 7), and increases a luminance of the liquid crystal (Figure 6).

The conventional methods do not recognize the potential of this "twist angle" to concurrently optimize a plurality of performance parameters. That is, at most, the conventional wisdom in the prior art of record (but not demonstrated in Baur) is that twist angle could be used as a parameter to affect speed of response.

In contrast, the present invention recognizes that, in addition to response speed, this angle can concurrently address additional performance parameters, including the reduction of threshold voltage (Figure 6, also page 16, lines 16-19) and optimizing the luminance of the liquid crystal (Figure 8, also page 16, lines 19-22).

Moreover, by further narrowing the range of the twist angle, as described in dependent claim 2, the contrast ratio can also be optimized (Figure 8, page 21, lines 21-25) in view of the constraints of the other parameter settings (see page 16, lines 24-27).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant presents the following issues for review by the Board of Patent Appeals and Interferences for the obviousness rejection based on US PATENT 5,576,867 to Baur et al.

Issue #1: Whether the narrow range for setting the twist angle, as described in the claimed invention, distinguishes the present invention from the similar device shown in Baur, wherein a much wider range is used for this parameter, when there is no suggestion in this reference as to the results to be obtainable if this specific parameter were to be separately adjusted, when there is no suggestion in this reference to separately adjust this specific parameter within the wide range described therein in order to optimize performance results, and when the reference is allegedly already optimally adjusted for the effect desired in that reference and this optimal adjustment occurs anywhere within the much wider range of that reference; and

Issue #2: Whether additional engineering evidence is required, when the graphs shown in Figures 6-8 clearly show quantitative measurements (e.g., "engineering results") of the effects of the narrow range of twist angle prescribed for the present invention.

VII. ARGUMENTS

ISSUE #1: The Narrow Range Prescribed by the Present Invention

A. The Examiner's Position on the Narrow Range of Twist Angle

On page 3 of the Final Office Action, the Examiner concedes that Baur fails to teach setting the twist angle to the narrow range of 0.5 to 4.0 degrees but considers that, because this reference specifies that twist angle be set within +/- 15^0 of 0^0, "... *optimization of the*

results effective variable β to comprise Applicant's ranges of 0.5 to 4.0 degrees and 1.5 to 2.0 degrees would be obvious to those having ordinary skill in the art of liquid crystals."

On page 4, the Examiner states as the motivation that such optimization would "*...produce a display with low dependence of image contrast on viewing angle.*" Presumably, this statement of motivation results from the wording lifted from the Abstract of Baur.

In the Advisory Action dated November 29, 2004, the Examiner states on the attachment page for the item 2 continuation: "... *Applicant's proposed amendments still rely largely on performance recitations in device claims. Performance recitations are generally considered to be met when the structural limitations, as claimed and as disclosed in the Specification, are met. This rationale is based upon the fact [that] the Applicant is required to provide an enabling disclosure for the structure that would perform as claimed. [The] Examiner considers the structural requirements as disclosed to be met by the applied prior art per Final Rejection; therefore, the structure would perform as claimed per Applicant's enabling disclosure.*"

Thus, it appears that the Examiner believes that Baur teaches the same structural limitations as the claimed invention and that the Appellant is improperly relying upon "performance recitations" as distinguishing from Baur.

The Appellant disagrees as discussed below, since the Examiner's position and reasoning are faulty for several reasons.

B. Appellant's Position on the Obviousness of the claimed narrow range

First, the Examiner's position is <u>flawed as a matter of law</u>.

The Examiner is understood as alleging that the claimed invention is merely the routine optimization of the parameters discussed in Baur. More significant to the present invention, the Examiner alleges that Baur recognized β as a "results effective variable."

In summary, the essence of the Examiner's position seems to be that optimization of β provides the benefit of "... *display with low dependence of image contrast on viewing angle.*"

Appellant submits that the Examiner's position and reasoning are faulty for several reasons.

First, it is noted that the Examiner does not point to specific lines in Baur that suggest to separately adjust tilt angle β as a parameter to be optimized for any desired characteristic.

Second, the Examiner fails to identify how Baur suggests that any further optimization is necessary or desirable. Indeed, Baur clearly teaches that its desired effect of providing a "... *display with low dependence of image contrast on viewing angle*" is already achieved by setting the parameters as identified therein.

Stated slightly differently, Baur is already optimized for this identified desired effect.

Furthermore, it is noted that Baur clearly teaches that this optimization occurs whenever tilt angle β is set anywhere within the broad range of −15 to + 15 degrees.

Therefore, Appellant submits that it cannot reasonably be asserted that Baur suggests further optimization, let alone an optimization that relies specifically upon tilt angle β.

Appellant further submits that the Examiner's position can only be described as alleging obviousness because the narrow ranges (e.g., 0.5 to 4.0 degrees/1.5 to 2.0 degrees) for tilt angle β prescribed in the present invention are included in the wider range of Baur (e.g., -15 to + 15 degees).

However, as clearly described in MPEP §2131.5:

"*If the claims are directed to a narrow range, the reference teaches a broad range, and there is evidence of unexpected results within the claimed narrow range, depending on the other facts of the case, it may be reasonable to conclude that the narrow range is not disclosed with "sufficient specificity" to constitute an anticipation of the claims. The unexpected results may also render the claims unobvious.*"

Appellant submits that the improved performance parameters identified in the specification (e.g., reduction of threshold voltage, increased response time, and optimal luminance, while concurrently controlling the contrast degradation) of the present Application exactly satisfies the above-identified requirement for identifying the "unexpected results" that occur for the narrow range of tilt angle prescribed by the present invention. That is, nowhere in Baur is there even a hint that these specific performance results should even be

measured, let alone identifying which specific design parameters affect these results or that tilt angle β is the specific parameter to adjust to affect these performance results.

Therefore, Appellant submits that the engineering graphs of the figures of the present Application provide the evidence of the unexpected results that are obtained when tilt angle β is set within the narrow ranges prescribed by the claimed invention.

Applicant further submits that the presence of these unexpected results, shown in the figures, is the correct legal standard for evaluation of obviousness of the present invention.

At best the Examiner's position can only be described as alleging that the present invention is possible within the range of –15 to + 15 degrees recited in Baur.

However, as clearly described in MPEP §2143.01: "*The mere fact that references can be combined or modified does not render the result combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)*" (emphasis in MPEP itself). Baur does not recognize the significance of tilt angle as a parameter to adjust to address the problem and results obtained in the present invention.

Without some indication of the significance of tilt angle, the most that can be reasonably alleged by the Examiner is that it would be "obvious to try" to continue adjusting all of the parameters in Baur. As clearly stated in MPEP §2144.05 IIB: "*A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)).*"

As the Court in that same case stated (emphasis in the holding itself): "*The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard.*"

Moreover, as mentioned above, Baur considers itself to already be optimized in the entire range of tilt angle –15 to + 15 degrees. There is no suggestion to continue to try to further optimize that device.

Secondly, the Examiner's position is flawed as a matter of fact.

First, it is again noted that the Examiner does not point to specific lines in Baur that suggest to separately adjust tilt angle β as a parameter to be optimized. Rather, the parameters of interest in Baur, as clearly identified in the Abstract, are "orientation angle" β_0 and "pretilt angle" α_0.

From this clear description in the Abstract that the two parameters that provide the desired result of a "... display with low dependence of image contrast on viewing angle," Baur clearly teaches against using tilt angle β as the parameter to be adjusted.

Second, relative to the Examiner's allegation in the Advisory Action that "*...Applicant's proposed amendments still rely largely on performance recitations in device claims*", Appellant submits that one of ordinary skill in the art would not agree with this characterization of the claim language.

Appellant submits that the claim language clearly requires that the tilt angle β be set to a narrow range defined in the claims. This is not a performance recitation but an actual physical adjustment of the hardware. To one of ordinary skill in the art, this physical adjustment is physically measurable. It is, therefore, a physical characteristic of the device itself. The only performance recitation in the claims is the recitation of the performance result of having made this physical adjustment of the hardware.

Appellant submits that such performance result recited in the claims does not in any way detract from the requirement that the device be physically adjusted to the required range of tilt angle. It is this required setting of the physically-measurable parameter tilt angle that is patentably significant as the requirement to be met in the structure of Baur. The Examiner concedes that Baur does not teach this narrow range.

ISSUE #2: Additional "Engineering Evidence" Required

A. The Examiner's Position on the Requirement for Additional Engineering Evidence

In the Advisory Action, the Examiner states: "*[The] Examiner considers the structural requirements as disclosed to be met by the applied prior art per Final Rejection; therefore, the structure would perform as claimed per Applicant's enabling disclosure. Also, the applied prior art is considered to provide an ample prima faci[e] case of obviousness that would require evidence to the contrary for adequate [rebuttal] as opposed to mere arguments, for example, engineering evidence of a contrary results effective variable.*"

Although it is not certain exactly what the Examiner is alleging in the above sentences, as best understood, the Examiner's position seems to be that, because Baur is alleged by the Examiner to have the same physical structure as the present invention, then Baur inherently possesses the performance results described by the claimed invention. Appellant responded to this position in the discussion above for the first issue.

Second, as best understood, the Examiner also alleges in the above sentences that the Appellant's experimental results shown in the figures included in the Application fails to qualify as "engineering evidence" and that additional "engineering evidence" would be required.

B. Appellant's Position on Additional Engineering Evidence

First, the Examiner's position is flawed as a matter of law.

Appellant respectfully submits that the Examiner seems to fail to understand that the present invention is completely dedicated to the description of Appellant's engineering measurements of the unexpected results obtained when tilt angle is adjusted as described.

That is, even if all other structural aspects of Baur are represented in the structure of the claimed invention, as the Examiner seems to consider, the figures of the present Application describe the actually-measured results that are obtained if tilt angle is set to the narrow range described, which feature the Examiner concedes is not described in Baur.

As such, Appellant submits that one of ordinary skill in the art would clearly consider that the figures of the present Application are, by definition, the "engineering evidence" required by the Examiner and that no additional "engineering evidence" would be required to describe the results actually obtained and measured by Appellant.

That is, by simply submitting these figures and describing their significance in the disclosure, Appellant is declaring that these figures correctly represent his "engineering evidence."

Appellant further submits that the Examiner's initial burden for a *prima facie* obviousness rejection would be that of demonstrating a reference that shows this same data or its equivalent. The Examiner concedes that Baur does not present this data or make any suggestion whatsoever that the performance results described in the present invention are significantly improved when tilt angle is set within range prescribed by Appellant.

The Examiner is not released from this initial burden by simply refusing to recognize the significance of Appellent's measured results, shown in the figures, or by alleging that such figures fail to qualify as "engineering evidence." Appellant submits that the entire disclosure is a summary of the engineering evidence behind the claimed invention.

If the Examiner wishes to dispute the technical accuracy of these figures, then his initial burden is not met until he provides a reasonable reference that shows that the engineering results illustrated in these figure are incorrect.

Clearly, the Examiner fails to provide a reference that either shows that these engineering results were known in the art or that demonstrates that these engineering results are technically inaccurate.

Because the Examiner (as best understood) merely alleges that Baur inherently would be able to provide the performance of the present invention (*if* tilt angle *were to be* set to the prescribed narrow range) but points to no indication in Baur that indicates that such performance results are even a concern therein, let alone that Baur suggest to adjust tilt angle for these unrecognized performance results, Appellant submits that the rejection currently of record fails to meet the Examiner's initial burden.

Secondly, the Examiner's position is flawed as a matter of fact.

Appellant respectfully submits that one of ordinary skill in the art would consider that, absent a reasonable rebuttal by the Examiner of incorrectness by presenting reasonable contradictory data, the information contained in the figures of the present application do indeed correctly reflect the actual test measurement data taken by Appellant, that the graphs presented in these figure are indeed "engineering evidence", that these graphs completely describe the facts asserted in the disclosure and described in the claimed invention, and that no additional "engineering evidence" would be required from Appellant to support the claimed invention.

Appellant further submits that, because Baur does not present these graphs for these performance results and, indeed, does not even discuss these performance results, these graphs provide the measured results that clearly indicates the significance of adjusting tilt angle to the prescribed range and such significance was not known by Baur.

That is, Appellant submits that these graphs are *prima facie* engineering evidence that clearly demonstrates the unexpected results of setting tilt angle to the narrow range defined in the claimed invention.

Appellant additionally submits that the reason the Examiner is confused is that the claims actually describe the physical setting of a measurable parameter of the device and not merely a performance result. Therefore, unless the Examiner can demonstrate that Baur explicitly teaches to limit tilt angle to the narrow range of the claimed invention, his initial burden has not been met.

IX. CONCLUSION

In view of the foregoing, Appellants submit that claims 1-17 are clearly patentably distinct from the prior art of record and in condition for allowance and that claims 18-20 are also allowable by reason of being subject to rejoinder. Thus, the Board is respectfully requested to remove the rejection of claims 1-17 and to rejoin claims 18-20.

Please charge any deficiencies and/or credit any overpayments necessary to enter this paper to Attorney's Deposit Account number 50-0481.

Respectfully submitted,

Dated: 2/7/05

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APPENDIX

Claims, as reflected by the Amendment Under 37 CFR §1.111 filed on May 25, 2004:

1. (Previously presented) An active matrix type liquid crystal display device comprising:

a thin film transistor (TFT) substrate having a common wiring and a source/drain wiring formed on a first substrate, said first substrate being provided with an insulating film covering said common wiring and said source/drain wiring, said insulating film being coated with a first alignment layer;

an opposite substrate, opposing to said TFT substrate, having a second alignment layer formed on a second substrate;

a liquid crystal held between said first alignment layer and said second alignment layer; and

a common electrode and a pixel electrode wired in parallel with each other and being formed as parts of said common wiring and said source/drain wiring, respectively, so that an angle made between a direction in which said first alignment layer is subjected to an aligning treatment and a direction in which said second alignment layer is subjected to an aligning treatment is set to a value of 0.5 to 4.0 degrees, said value providing a setting that concurrently decreases a threshold voltage between the pixel electrode and the common electrode required to change a direction of said liquid crystal therebetween, increases a response of switching of said liquid crystal, and increases a luminance of said liquid crystal.

2. (Previously presented) The active matrix type liquid crystal display device according to claim 1, wherein said angle made between said direction in which said first alignment layer is subjected to said aligning treatment and said direction in which said second alignment layer is subjected to said aligning treatment is set to a value of 1.5 to 2.0 degrees, said value of 1.5 to 2.0 degrees further narrowing said setting to additionally control a contrast degradation of said liquid crystal.

3. (Previously presented) The active matrix type liquid crystal display device according to claim 1, wherein said direction in which said first alignment layer is subjected to said aligning treatment has an angle of 5 to 45 degrees with respect to a parallel direction in which said common electrode and said pixel electrode are wired in parallel with each other.

4. (Original) The active matrix type liquid crystal display device according to claim 1, wherein an angle made between a direction in which said second alignment layer is subjected to aligning treatment and a direction in which said common electrode and said pixel electrode are wired in parallel with each other is larger than an angle made between said direction in which said first alignment layer is subjected to aligning treatment and a direction in which said common electrode and said pixel electrode are wired in parallel with each other.

5. (Original) The active matrix type liquid crystal display device according to claim 1, wherein said TFT substrate and said opposite substrate having said liquid crystal therebetween include a first substrate side polarizer and a second substrate side polarizer on opposite sides opposing to inner sides of said TFT substrate and said opposite substrate facing said liquid crystal, respectively, and in said first substrate side polarizer and said second substrate side polarizer, the absorption axis and transmission axis are mutually orthogonal, and any one of the absorption axis and the transmission axis of said first substrate side polarizer agrees with said direction in which said first alignment layer is subjected to aligning treatment.

6. (Previously presented) The active matrix type liquid crystal display device according to claim 1, wherein a distance between surfaces of said first alignment layer and said second alignment layer opposing to each other is set to a value of 1.0 μm to 6.0 μm.

7. (Previously presented) The active matrix type liquid crystal display device according to claim 1, wherein a distance between said common electrode and said pixel electrode wired in parallel with each other is set to a value of 2 μm to 15 μm.

8. (Original) The active matrix type liquid crystal display device according to claim 1, wherein a gate wiring of a thin film transistor is formed on said first substrate simultaneously with said common wiring.

9. (Previously presented) The active matrix type liquid crystal display device according to claim 1, wherein an island disposed above said common wiring and comprising a semiconductor film is formed in said insulating film, and said island constitutes an active region of a thin film transistor.

10. (Previously presented) An active matrix type liquid crystal display device comprising:

a first substrate;

a first alignment layer formed on a surface of said first substrate;

a second substrate opposing said first substrate;

a second alignment layer formed on said second substrate; and

a liquid crystal chain held between said first alignment layer and said second alignment layer,

wherein, in the absence of a potential difference, a first end of said liquid crystal contacting said first alignment layer is rotated to form a first angle relative to a reference on said first substrate, a second end of said liquid crystal is rotated to form a second angle relative to the reference on said first substrate, and a value between said first angle and said second angle is set to provide an increase in speed of response to an applied excitation voltage as compared to a speed of response when said value is zero degrees while concurrently decreasing a threshold voltage required to drive a direction change of said liquid crystal and increasing a luminance of said liquid crystal.

11. (Previously presented) The device according to claim 10, wherein an absolute value between said first angle and said second angle is set in a range between about 0.5 to about 4.0 degrees.

12. (Previously presented) The device according to claim 10, wherein an absolute value between said first angle and said second angle is in a range between about 1.5 to about 2.0 degrees, said narrower range additionally controlling a contrast degradation of said liquid crystal.

13. (Previously presented) The device according to claim 14, wherein said first angle made from said first alignment layer subjected to an aligning treatment has an angle in a range between about 5 to about 45 degrees with respect to said reference on said first substrate, said reference being a longitudinal axis of said pixel electrode.

14. (Previously presented) The device according to claim 10, further comprising:

a common wiring and a source/drain wiring formed on said first substrate; and

a common electrode and a pixel electrode formed as parts of said common wiring and said source/drain wiring,

wherein said common electrode and said pixel electrode are wired in parallel with each other.

15. (Previously presented) The device according to claim 10, wherein a black display is provided in the absence of the potential difference.

16. (Previously presented) The device according to claim 10, wherein light transmittance occurs in the absence of the potential difference.

17. (Previously presented) The device according to claim 15, wherein light transmittance occurs in said black display.

18. (Constructively withdrawn) A method of producing an active matrix type liquid crystal display device, said method comprising:

holding a liquid crystal between a first alignment layer and a second alignment layer,

wherein an angle made between a direction in which the first alignment layer is subjected to a first aligning treatment and a direction in which the second alignment layer is subjected to a second aligning treatment is set to a value of 0.5 to 4.0 degrees, said value providing a setting that concurrently decreases a threshold voltage between the pixel electrode and the common electrode required to change a direction of said liquid crystal therebetween, increases a response of switching of said liquid crystal, and increases a luminance of said liquid crystal.

19. (Constructively withdrawn) The method according to claim 18, wherein said angle made between said direction in which said first alignment layer is subjected to said aligning treatment and said direction in which said second alignment layer is subjected to said aligning treatment is set to a value of 1.5 to 2.0 degrees to additionally control a contrast degradation of said liquid crystal.

20. (Constructively withdrawn) The method according to claim 18, wherein said direction in which said first alignment layer is subjected to said aligning treatment has an angle of 5 to 45 degrees with respect to a direction in which a common electrode and a pixel electrode are aligned.